

TRANSTHORACIC OR TRANSHIATAL RESECTION FOR MIDDLE- AND LOWER-THIRD ESOPHAGEAL CARCINOMA?

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Transthoracic esophagectomy (TTE) and transhiatal esophagectomy (THE) are two common methods of resection for esophageal cancer. Although many studies have been performed in Western countries, there are still controversies over which method is the better procedure. In this study, postoperative improvement in dysphagia and the degree of postoperative pain were compared. The cases of 50 patients undergoing TTE and 23 undergoing THE for esophageal cancer between March 1997 and October 2002 were retrospectively reviewed. The location of the lesion, clinical stage (TNM), operative time, operative blood loss, hospital stay, complications, number of lymph nodes dissected, and survival duration were recorded. Pre- and postoperative dysphagia scores and postoperative pain perception (using a visual analog scale) were analyzed. Preoperative clinical stage and lesion site were not significantly different in the TTE and THE groups. The operative time was longer and the number of lymph nodes removed was larger in the TTE group. However, there were no differences in operative blood loss, hospital stay, complications, survival duration, and improvement in dysphagia. Pain perception in the THE group was significantly better than that in the TTE group. THE is a safe and rapid procedure, with recovery and survival periods similar to those for TTE. Both patient groups enjoyed the same ability to eat. Therefore, THE is an acceptable alternative to TTE for patients with middle- and lower-third esophageal cancer. Moreover, THE caused much less postoperative pain than TTE, which made patients more comfortable.

Key Words: transthoracic, transhiatal, esophagectomy, esophageal cancer, dysphagia score, visual analog scale
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Esophageal cancer is a disease with a poor prognosis [1,2]. The outcome is largely poor despite the greatest surgical efforts. Although the results of surgery are not good, complete esophagectomy remains the mainstream treatment as it offers the best opportunity for cure or palliation [3,4].

There are two common methods of esophagectomy, namely transthoracic (TTE) and transhiatal (THE). Terek

successfully resected an esophageal carcinoma using the transthoracic approach in 1913 [2]. After that, esophagectomy through a right side thoracotomy was advocated by some authors [5]. It allows for a wide operative field for mediastinal lymphadenectomy and direct control of bleeding [6]. THE was first performed by Turner [7] and later advocated by Orringer [8]. It has the advantages of not requiring thoracotomy and having a lower incidence of pulmonary complications [9] and a shorter operative time [10]. Although some authors have reported no difference compared with TTE [11,12], others have shown a higher rate of respiratory complications [4,13]. Most studies have examined lower-third lesions; studies in Asian people are few. In this study, we compared pre- and postoperative dysphagia scores [14]

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and postoperative pain perception using a visual analog scale (VAS) [15], which are lacking in other studies.

MATERIALS AND METHODS

Between March 1997 and October 2002, 50 patients underwent TTE and 23 patients underwent THE in Kaohsiung Medical University Hospital. In this study, their cases were retrospectively reviewed. Operative time, intraoperative blood loss, postoperative hospital stay, complications, number of lymph nodes removed, and survival duration were recorded. The dysphagia score was recorded preoperatively and at 1, 3, 6, and 12 months postoperatively. The VAS for pain perception was recorded postoperatively at 1 week and 1, 3, and 6 months. Preoperative studies to confirm resectability included esophagogram, ultrasound endoscopy, and chest computerized tomography (CT). The diagnosis was confirmed by biopsy. Bronchoscopy was indicated for middle-third cancers. All patients received pulmonary physiotherapy using incentive spirometry and pulmonary inhalation of mucolytics for bronchial toilet at least 7 days before the operation.

Transthoracic approach

The patient was placed in the supine position with the head turned towards the right and neck extended. After laparotomy, the stomach was mobilized by dividing the greater omentum while preserving the right gastroepiploic vessels. The short gastric vessels were also divided. The esophagogastric junction was freed from the hiatus. The lesser omentum and the gastrohepatic ligament were then divided. The left gastric artery was carefully ligated and divided. All celiac lymph nodes were simultaneously dissected. The abdominal esophagus was transected and both ends sutured securely. The proximal end was then pushed upward into the mediastinum and the hiatus was closed with non-absorbable stitches. After Kocher's maneuver and pyloromyotomy, the esophagogastric junction and part of the lesser curvature were resected using a curved Akiyama Petz autosuture.

A left cervical incision was made along the anterior border of the left sternocleidomastoid muscle and dissection was carried out along the prevertebral space. When the cervical esophagus was found, blunt dissection was performed down to the level of the thoracic outlet. The esophagus was transected and the distal stump was securely sutured. A retrosternal tunnel was created and the stomach was passed up through this tunnel into the neck. Cervical

esophagogastrostomy was performed by hand-sewn single mattress anastomosis.

The patient was then repositioned for right thoracotomy. The mediastinal pleura was incised. Both cut ends of the esophagus were found and dissected towards the tumor. The tumor and adjacent tissues were totally removed. Mediastinal lymph nodes were then dissected for sampling.

Transhiatal approach

The patient was positioned and the stomach mobilized as in TTE, but there was no transection of the abdominal esophagus. The cervical phase was also performed as for TTE, but with no transection of the esophagus. With the left hand inserted through the cervical wound and the right hand through the diaphragmatic hiatus, blunt dissection was carried out along the esophagus until the entire organ was mobilized. Several centimeters of esophagus were gently pulled up into the cervical region and then transected. The distal stump was carefully closed and the stomach and esophagus (with tumor) were then removed through the diaphragmatic hiatus. Using a curved Akiyama Petz autosuture, the esophagus, cardia, and an area along the lesser curvature were resected. The stomach was delivered to the neck wound through the retrosternal tunnel. Again, cervical esophagogastrostomy was performed as for TTE.

Postoperative period

Feeding jejunostomy was routine for both TTE and THE patients. Patients were transferred to the intensive care unit postoperatively. Total parenteral nutrition was administered. Patients were weaned off the ventilator and were sent back to the ward as soon as possible. Jejunostomy feeding was administered if there was bowel movement. If there was no anastomotic leakage, oral intake was given on the 10th day. Postoperative pain was relieved by patient-controlled analgesia using intravenous morphine for the first 3 days. Patients were followed up regularly in the outpatient clinic, and radiotherapy was administered for gross or microscopic residual tumor.

Statistical analysis

The age, sex, lesion location, and clinical stage were analyzed using the Chi-squared test. The operative time, intraoperative blood loss, postoperative hospital stay, and number of lymph nodes dissected were compared using Student's *t* test. Postoperative complications were compared using Fisher's exact test, the dysphagia score and VAS using repeated ANOVA, and survival using the log-rank test.

RESULTS

The number of patients, age, sex ratio, lesion location, and clinical stage in the two groups were similar (Table 1). The mean operative time for TTE was significantly longer than that for THE (Table 2). The mean intraoperative blood loss and mean postoperative hospital stay were not significantly different. Significantly more lymph nodes were dissected in the TTE group (Table 2). There were two 30-day mortalities in each group. In the TTE group, five patients (10%) had pneumonia, three (6%) had gastrointestinal bleeding, and five (10%) had anastomotic leakage. In the THE group, three patients (13%) had pneumonia, two (8.7%) had gastrointestinal bleeding, three (13%) had anastomotic leakage, and one (4.3%) had cardiac arrhythmia. There was no significant difference in complications between the two groups ($p > 0.05$).

No tracheal tear and no conversion were recorded in the THE group. All the proximal and distal margins were free of tumor. Mean preoperative dysphagia score in the TTE

group was 3.10 ± 0.47 . Mean postoperative score at 1 month was 2.29 ± 0.58 , at 3 months was 1.63 ± 0.61 , at 6 months was 1.14 ± 0.64 , and at 12 months was 0.92 ± 0.59 ; the decrease in score was significant ($p < 0.001$). In the THE group, the respective pre- and postoperative scores were 3.09 ± 0.54 , 2.62 ± 0.5 , 1.71 ± 0.64 , 0.78 ± 0.65 , and 0.43 ± 0.51 ; again, the decrease was significant ($p < 0.001$). The degree of decrease in score was similar in the two groups ($p = 0.336$) (Figure 1). In the TTE group, mean VAS at 1 week and 1, 3, and 6 months was 8.10 ± 0.78 , 6.08 ± 1.05 , 3.85 ± 0.92 , and 2.28 ± 0.91 , respectively. In the THE group, these scores were 6.67 ± 1.02 , 3.05 ± 0.92 , 0.71 ± 0.64 , and 0.31 ± 0.48 , respectively (Figure 2). The score in both groups decreased significantly ($p < 0.001$). Moreover, the VAS was significantly lower in the THE group than in the TTE group ($p < 0.001$). The 2-year survival rate in the two groups was not significantly different (TTE: 28% vs THE: 39.5%; $p = 0.295$) (Figure 3). There was no significant difference in survival rates between patients with middle- and lower-third lesions in the THE group.

DISCUSSION

In 2000, 890 patients died of esophageal cancer in Taiwan (population 23 million) [16]. The expected 5-year survival rate is only 5–12% [17]. The treatment of esophageal cancer remains a great challenge to surgeons. Few reports have compared TTE and THE for middle-third lesions in Asians. Even in recent reports, only lower-third lesions were com-

Table 1. Demographic data of transthoracic (TTE) and transhiatal (THE) esophagectomy groups

| | TTE (n = 50) | THE (n = 23) |
|---------------------------------|-----------------|-----------------|
| Age (yr) | 52.6 \pm 10.6 | 57.4 \pm 12.4 |
| Sex (male:female) | 46:4 | 21:2 |
| Location of lesion | | |
| Middle third | 42 | 17 |
| Lower third | 8 | 6 |
| Clinical stage according to TNM | | |
| II | 11 | 5 |
| III | 39 | 18 |
| Chi-squared test, $p > 0.05$. | | |

Table 2. Comparison of operative results for transthoracic (TTE) and transhiatal (THE) esophagectomy

| | TTE (n = 50) | THE (n = 23) |
|---------------------------------|-------------------|-------------------|
| Operative time (min)* | 373.4 \pm 94.5 | 265.5 \pm 49.3 |
| Intraoperative blood loss (mL) | 354.5 \pm 217.4 | 377.2 \pm 251.6 |
| Postoperative hospital stay (d) | 20.7 \pm 17.4 | 18.6 \pm 13.7 |
| Number of lymph nodes removed* | 9.3 \pm 2.7 | 5.3 \pm 1.9 |

*Student's *t* test, $p < 0.05$.

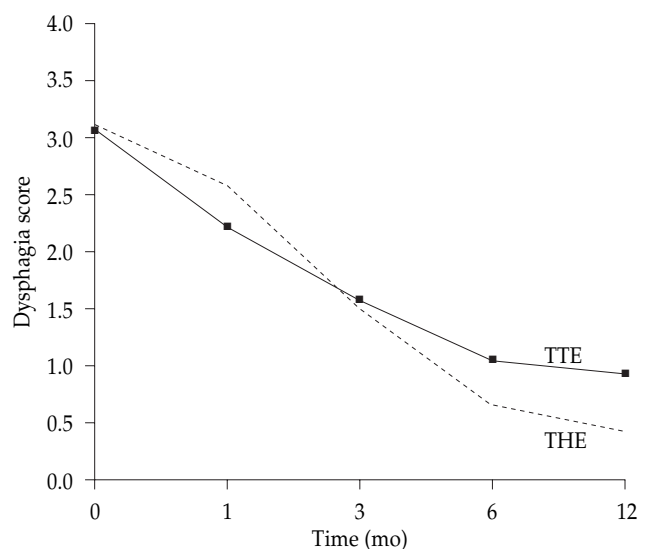


Figure 1. Comparison of improvement in dysphagia between transthoracic (TTE) and transhiatal (THE) esophagectomy groups, using repeated ANOVA.

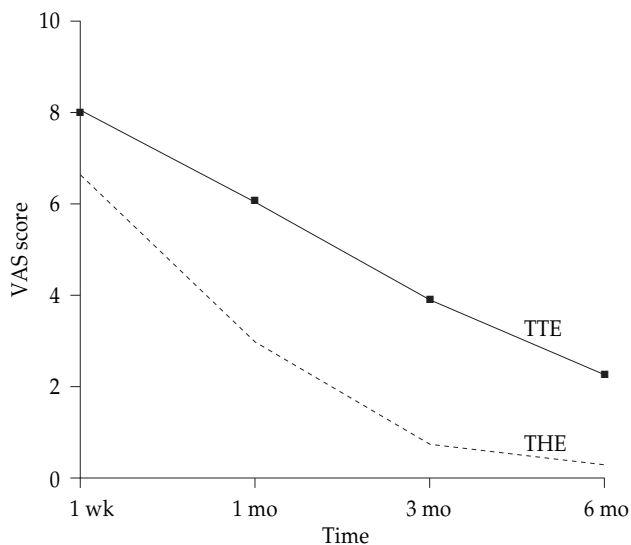


Figure 2. Comparison of improvement in visual analog scale score between transthoracic (TTE) and transhiatal (THE) esophagectomy groups, using repeated ANOVA.

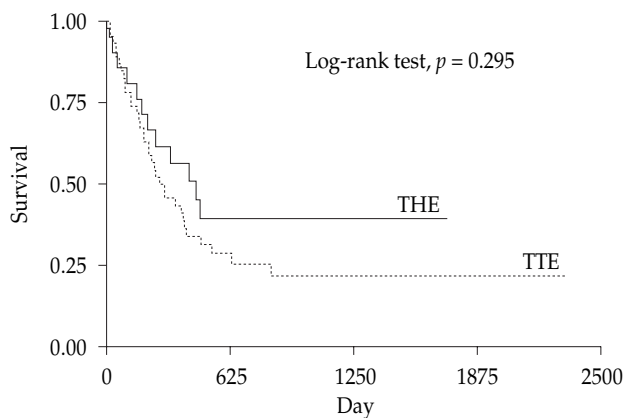


Figure 3. Kaplan-Meier survival curves for transthoracic (TTE) and transhiatal (THE) esophagectomy.

pared [3,4,18]. This study included mostly lesions in the middle third.

There was no difference in age, sex, lesion location, and clinical stage between the two treatment groups. Post-operative stay, intraoperative blood loss, and complications were also similar in the two groups. The only significant difference was that the operative time was shorter in the THE group.

One important reason for proposing TTE is that the complete mediastinal node dissection provides a survival benefit [5,6]. However, more and more surgeons have reported that there is no significant difference in survival between the two procedures [10,13]. A possible explanation

would be that lesions in those studies were mainly in the lower third: in these studies, transhiatal dissection of lower-third tumors was done under direct vision and lymph node dissections were performed as in TTE. In our series, 80.8% of tumors were in the middle third. The number of lymph nodes dissected in THE, which could not be performed under direct vision, was less than that in TTE ($p < 0.001$). However, there was no difference in survival between the two groups (Figure 3). This may be due to the comparable number of involved nodes in the two groups. Some authors have reported that survival is influenced more by disease stage than the type of operation performed [10,19]. Radical mediastinectomy may only have value in the treatment of T1 cancers. THE is advocated by many authors as being more useful in lower-third cancers because the tumor can easily be dissected under direct vision [3,20]. Wong even considers middle-third lesions a contraindication for THE [21]. Orringer et al reported a 5-year survival rate of 32% for lower-third and 18% for middle-third esophageal cancer in 1993 [22], which had decreased to 26% for lower-third and 13% for middle-third tumors by 1999 [19]. It is obvious that middle-third lesions are still associated with worse survival. In our series, survival rates with THE for middle- and lower-third tumors were not significantly different (log-rank test). Barbier et al reported that THE was the treatment of choice for esophageal carcinoma at all levels [23], and we have not had any difficulty in dissecting a middle-third tumor through the hiatus because our patients were fully assessed and carefully staged preoperatively by our cancer team and treated according to our treatment guidelines for esophageal carcinoma. This made the results of THE, even in middle-third cancers, better than expected.

Although the present series is a retrospective study, the preoperative clinical stage was not significantly different between the two groups. That is to say, there was no bias to assign less-advanced cases to transhiatal resection. In fact, THE can be applied to all patients who require esophagectomy for cancer except those with tracheobronchial invasion, fixation of tumor to the aorta, or dense adherence to the surrounding mediastinal organs due to previous inflammation or irradiation. In simpler words, THE should be converted to TTE only if the surgeon feels unsafe during the dissection.

The new information in this paper is the comparison of two basic subjective feelings, the degree of dysphagia and pain perception, which were missing in past studies. They affect daily quality of life. Although they do not completely reflect the quality of life, the improvement in swallowing and severity of postoperative pain are of most concern to

patients with dysphagia who undergo surgery, and dysphagia score and VAS are the best systems to measure these symptoms. In this study, preoperative dysphagia score was similar in the two groups and improved significantly by the same degree postoperatively. However, for pain perception, the VAS in the TTE group was 8.10 ± 0.78 and that in the THE group was 6.67 ± 1.02 in the immediate postoperative period. At 1 month, the VAS in the THE group dropped to 3.05 ± 0.92 , but remained at 6.08 ± 1.05 in the TTE group, which was significantly different. At 3 months, there was almost no pain in the THE group. On the contrary, the VAS at 6 months was 2.28 ± 0.91 in the TTE group. That is to say, TTE caused chronic pain and annoyance for up to 6 months in some people.

In conclusion, THE is a safe procedure and faster than TTE, with recovery and survival comparable to those with TTE. Both groups had the same degree of improvement in dysphagia. Therefore, THE is an acceptable alternative procedure to TTE for middle- and lower-third esophageal cancers. Moreover, THE caused much less postoperative pain than TTE, making patients more comfortable.

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中段與下段食道癌 — 要經胸廓還是經橫膈裂孔食道切除?

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經胸廓或橫膈裂孔食道切除乃食道癌手術兩種通用之方法，雖然在西方國家有相當多的研究，此二種方法中何者較優，仍有爭議。本研究針對本土病患，除比較兩種方法外，並對其術前、後吞嚥困難分數 (dysphagia score) 之改善及疼痛度 (VAS) 也一併分析。從 1997 年 3 月至 2002 年 10 月，50 位經胸廓及 23 位經橫膈裂孔食道切除之食道癌病患作回顧分析。其病灶的位置、臨床的分期、手術時間、術中失血量、住院日數、併發症、淋巴結摘除數目及存活期予以記錄；並將其術前、後吞嚥困難分數及術後疼痛程度也一併比較。術前分期、病灶的位置、術中失血量、住院日、併發症、存活期及吞嚥困難之改善，兩組並沒有統計上的意義。經胸廓食道切除的手術時間較長，淋巴結摘除之數量較多。但經橫膈裂孔食道切除之病患其 VAS 明顯較佳。經橫膈裂孔食道切除乃一安全且較快之步驟，其復原及存活期與經胸廓食道切除不相上下，兩組之病患都能得到良好的進食品質。所以經橫膈裂孔食道切除對中及下段之食道癌不失為另一良好之手術方法。再者，其術後之疼痛遠輕於經胸廓手術者，以致病患能獲得較舒服的生活品質。

關鍵詞：經胸廓，經橫膈裂孔，食道切除，食道癌，dysphagia score，
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